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Newbury

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[45] **Date of Patent: Feb. 21, 1989**

[54] **ELECTROSTATOGRAPHIC REPRODUCING MACHINE AND PROCESS UNIT THEREFOR**

[75] Inventor: **David M. Newbury**, Welwyn Garden City, England

[73] Assignee: **Xerox Corporation**, Stamford, Conn.

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[4] **G03G 15/00**

[52] **U.S. Cl.** ..... **355/3 SH**; 355/3 TR

[58] **Field of Search** ..... 355/3 TR, 3 CH, 3 SH, 355/3 R, 3 DR; 250/324–326

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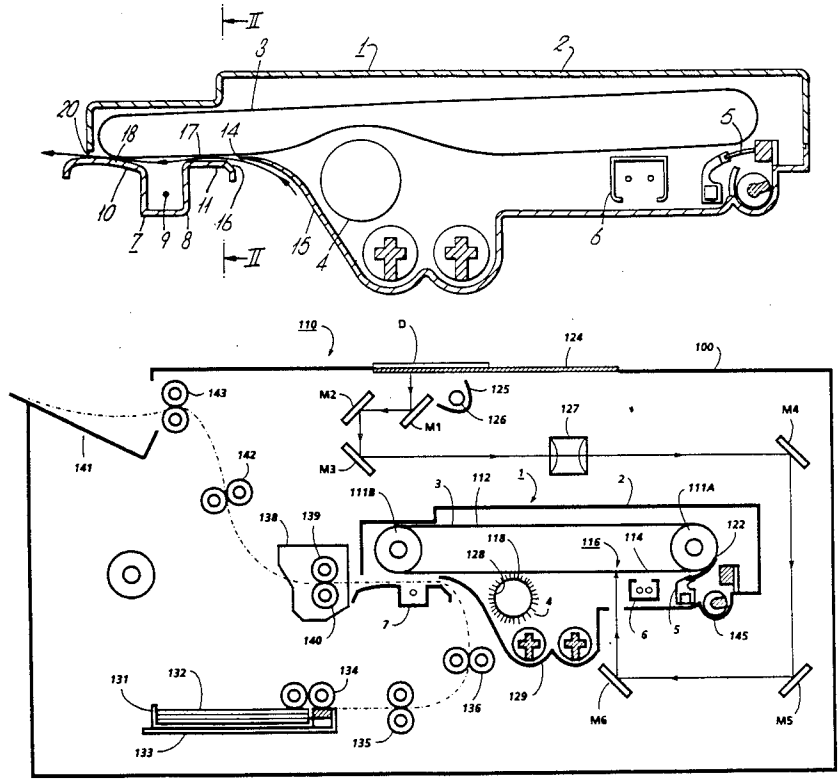
2165491A 4/1986 United Kingdom .

Primary Examiner—R. L. Moses

[57] **ABSTRACT**

A process unit which can be removably mounted in a main assembly of an electrostatographic copying machine. The unit comprises a housing enclosing an imaging member and, optionally, other processing means such as a development device, a cleaner, and a charge corotron. The transfer corotron for transferring a toner image from the imaging member to a copy sheet is incorporated in the cassette housing, thus avoiding the need to provide a separate movable cover to protect the imaging member from contamination, physical damage, and light exposure when the cassette is removed from the main assembly of the copier. An electrically conductive guide member for guiding a copy sheet into contact with the imaging member and an electrically conductive guide member for guiding the copy sheet away from the imaging member are both formed integrally with the shield of the transfer corotron as extensions thereof. In consequence of electrically biasing the shield when the process unit is inserted into its operative position in the main assembly, the guides are maintained at the same potential as the shield thereby reducing charge leakage through the copy sheet in the transfer zone, enabling effective image transfer even for moist and relatively highly conductive copy sheets. The exit guide is suitably contoured to ensure that the trailing edge of the copy sheet positively contacts the imaging member.

13 Claims, 9 Drawing Sheets



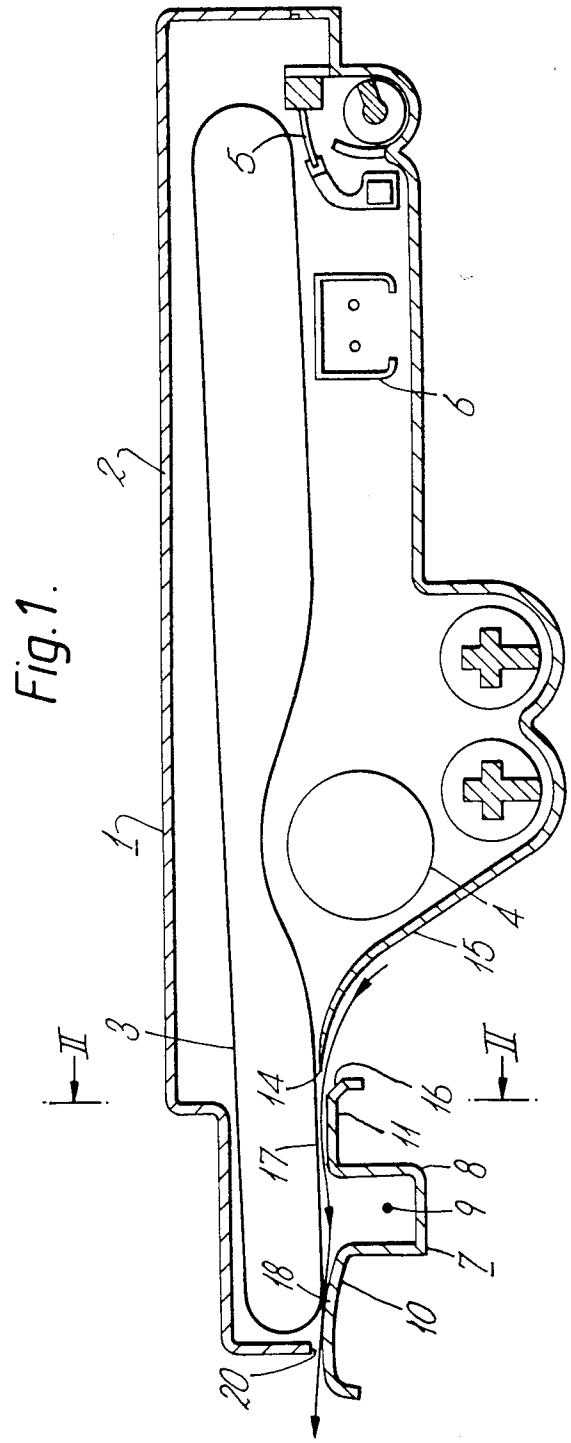


Fig. 1.

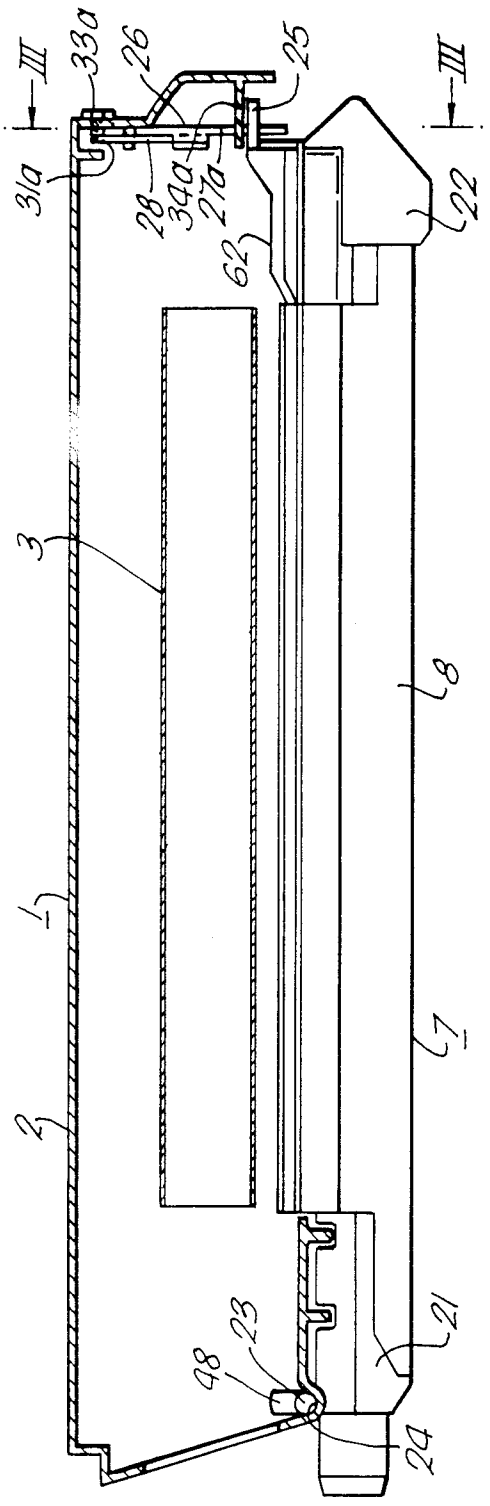


Fig. 2.

Fig.3.

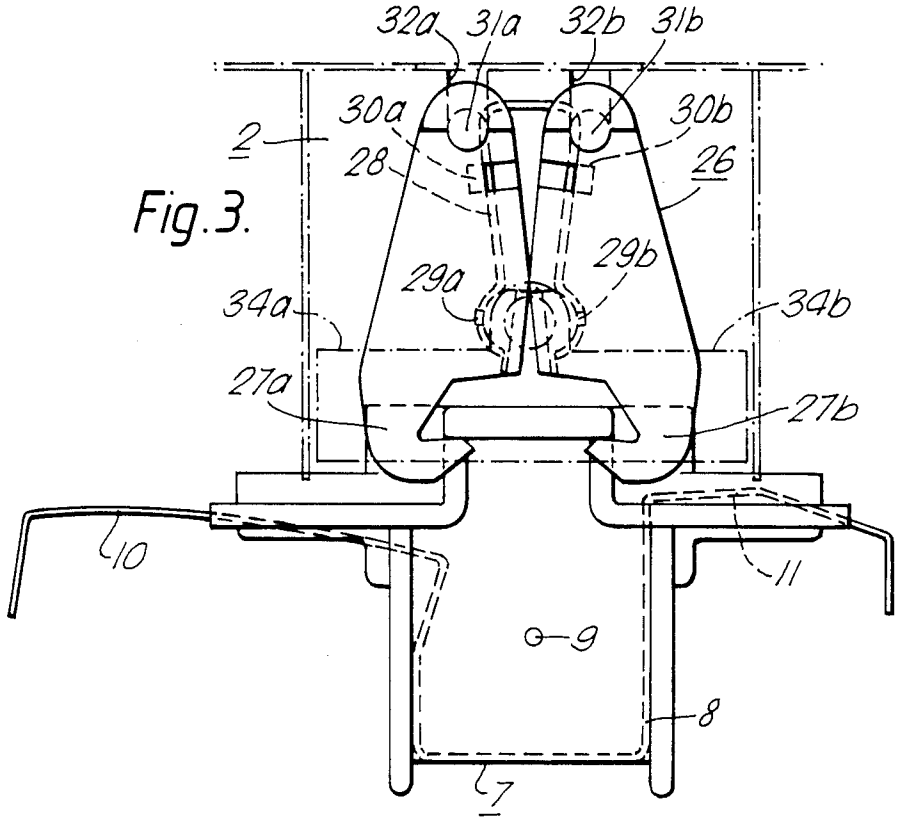

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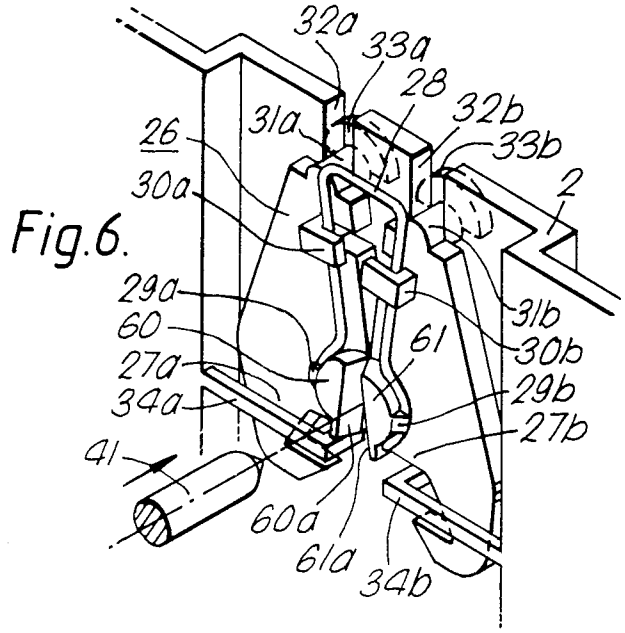
Fig.6.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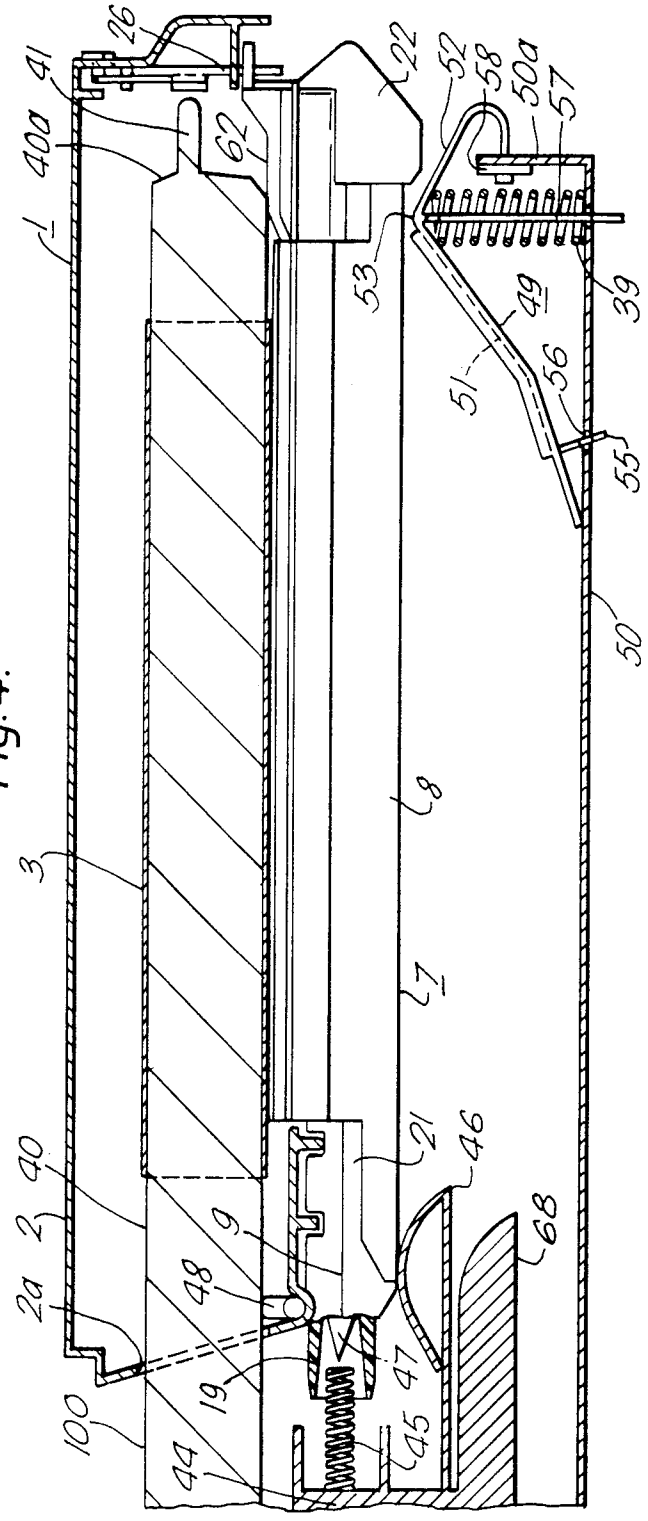
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44
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Fig. 4.

Fig. 5.

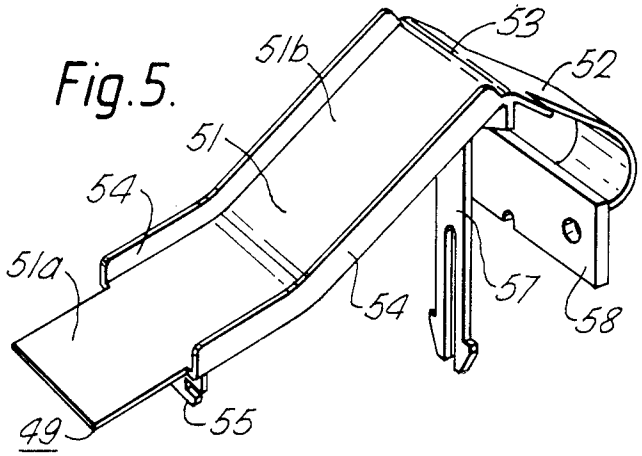
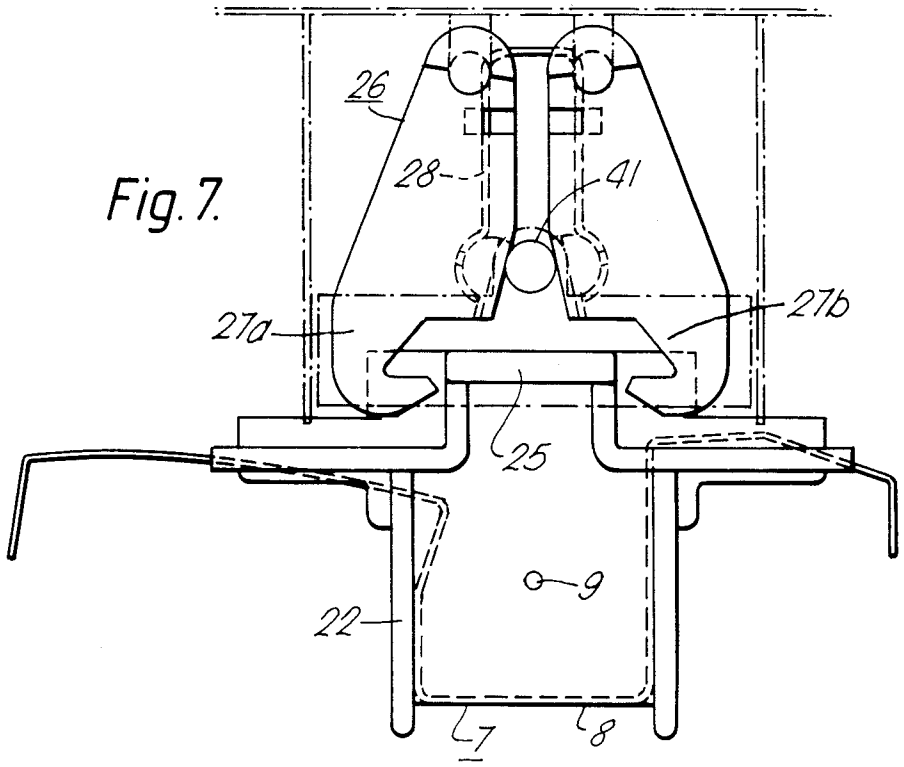


Fig. 7.



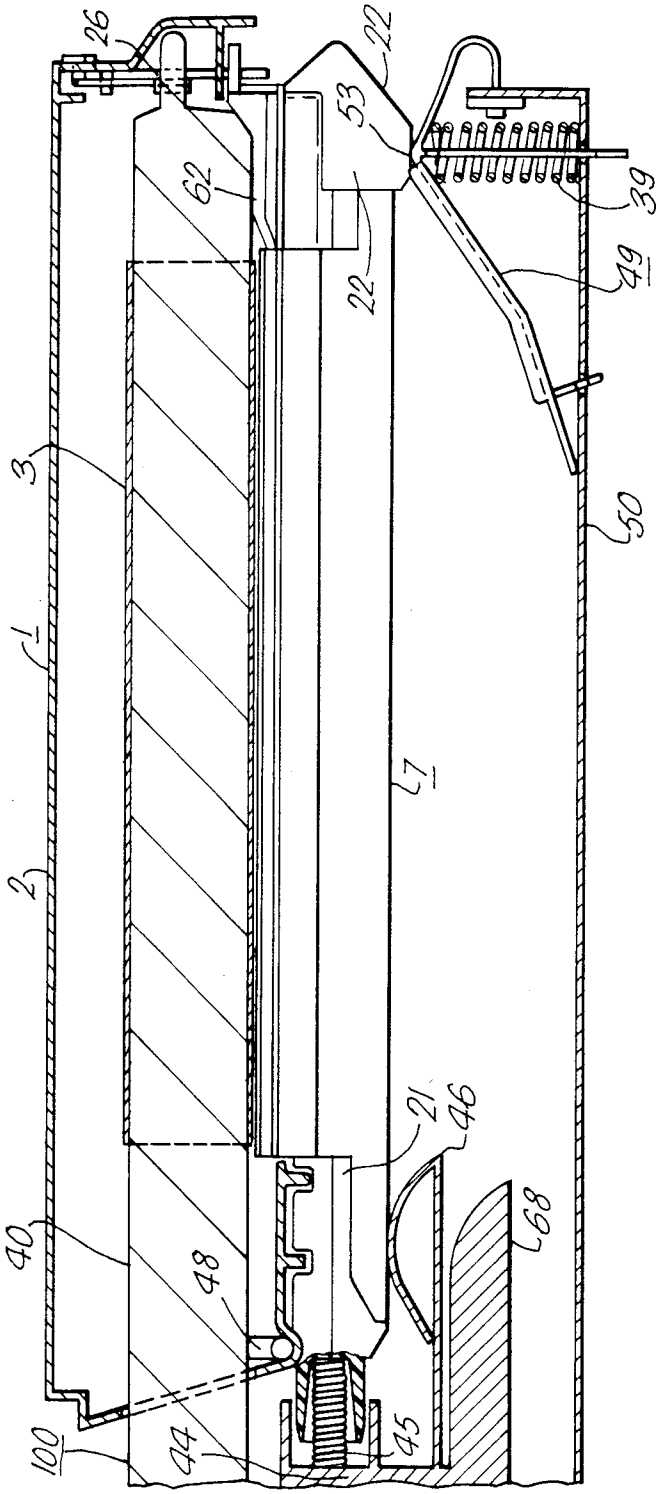


Fig.8.

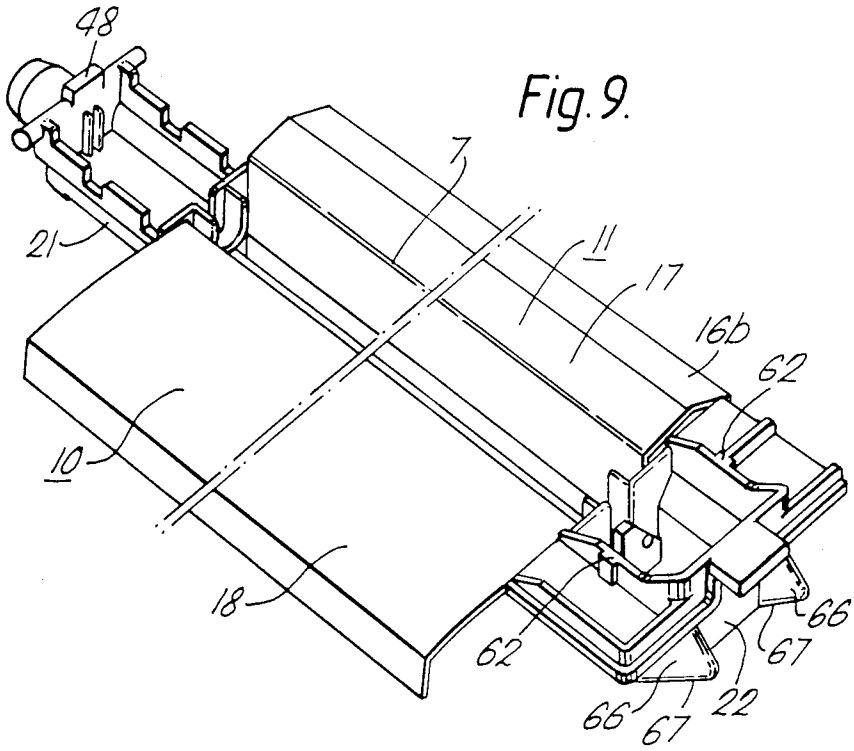


Fig. 9.

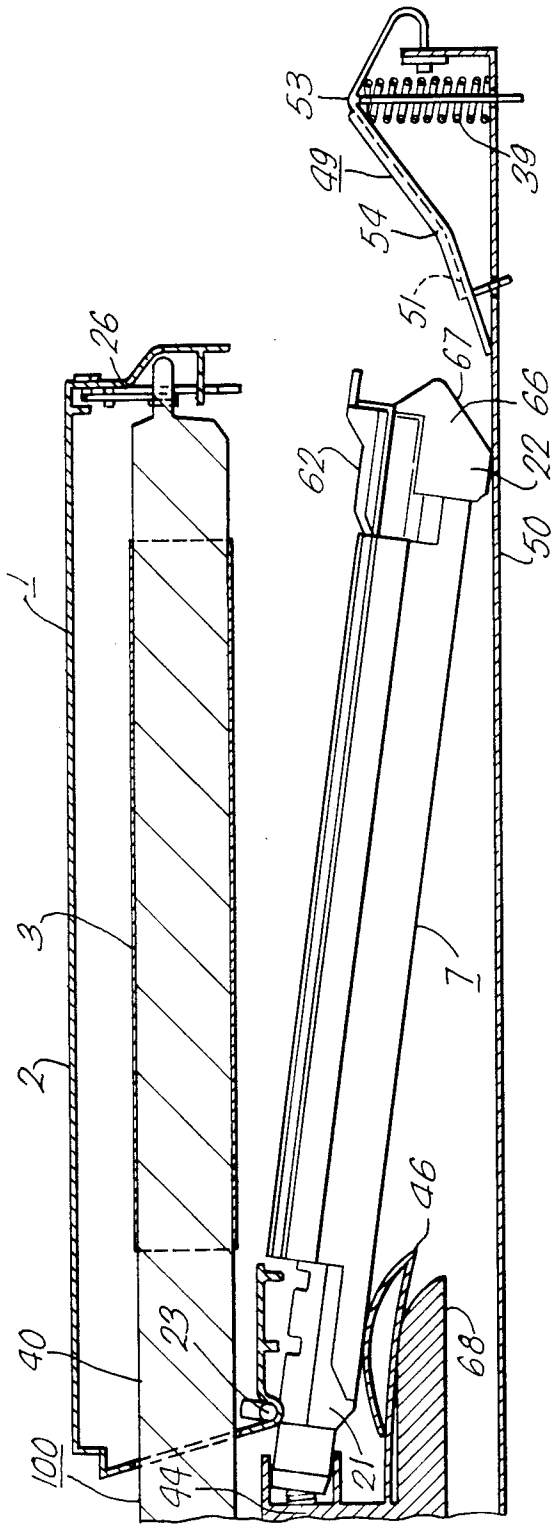


Fig. 10.

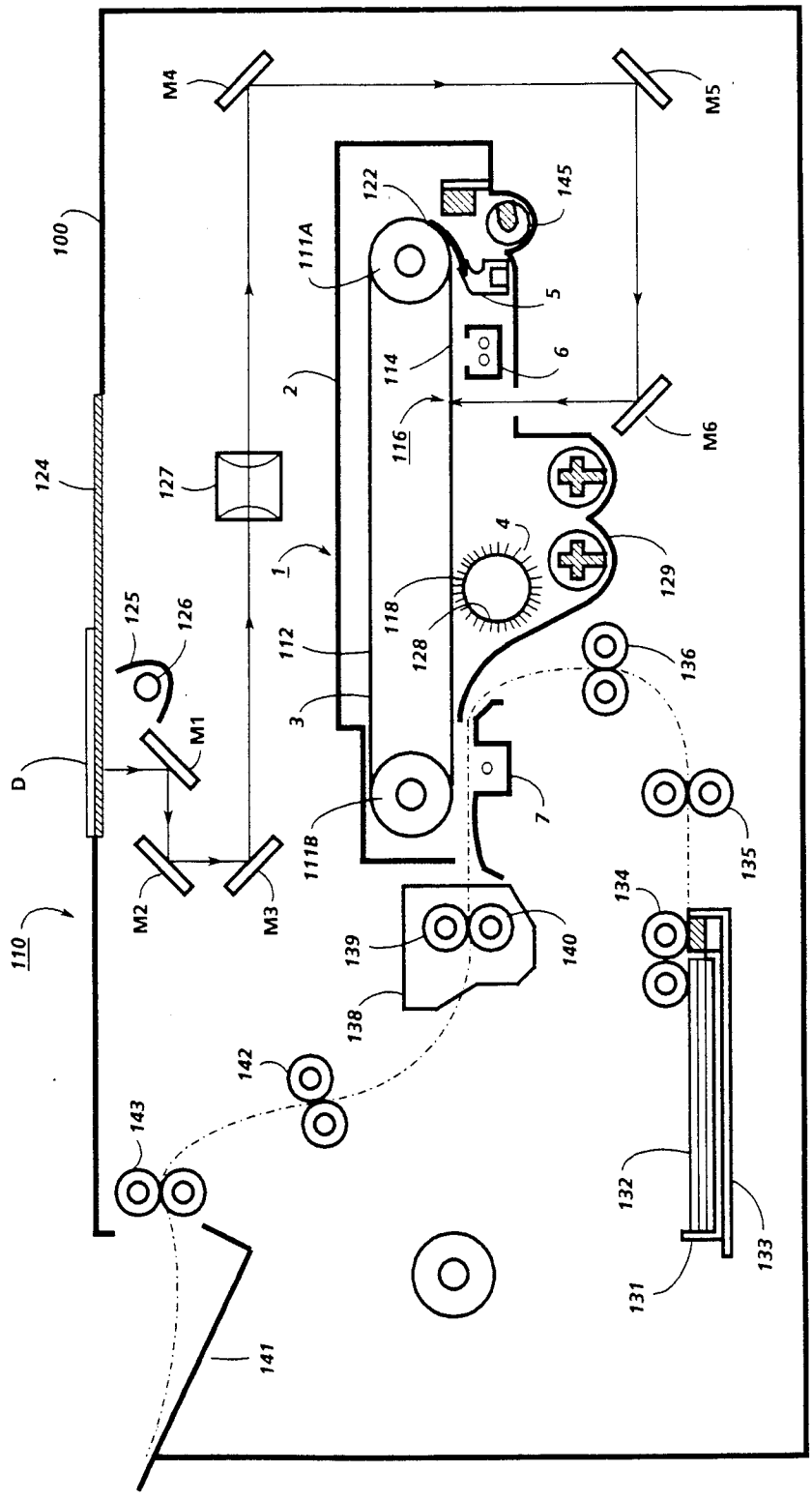

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FIG. 11

ELECTROSTATOGRAPHIC REPRODUCING MACHINE AND PROCESS UNIT THEREFOR

CROSS REFERENCE TO RELATED APPLICATIONS

Reference is made to the following copending applications filed concurrently herewith: application Ser. No. 131,163 entitled "Process Unit Incorporating A Charging Device" in the name of Alan C. R. Howard et al.; application Ser. No. 131,162 entitled "Process Unit For An Imaging Apparatus" in the name of Robert A. Carter; application Ser. No. 131,074 entitled "Process Unit For An Imaging Apparatus" in the name of Alan C. R. Howard et al, application Ser. No. 131,073 entitled "Fiber Traps In Copiers" in the name of Philip R. Thompson. Reference is also made to copending application Ser. No. 038,093 entitled "Process Unit For An Imaging Apparatus" field Apr. 14, 1987 in the name of Robert A. Carter.

BACKGROUND OF THE INVENTION

This invention relates to an electrostatographic reproducing machine, particularly a xerographic copier, comprising a transfer corotron for transferring a developed electrostatic latent image from an imaging member to a copy sheet, wherein the copy sheets are guided into contact with the imaging member by a guide member adjacent the transfer corotron. The invention further relates to a process unit adapted to be removably mounted in a main assembly of an electrostatographic reproducing machine, wherein the imaging member, the transfer corotron, and the guide member are included in the process unit.

There is a trend nowadays to incorporate the imaging member together with other process means such as a charge corotron, a development device, and a cleaning device in a removable process unit or cassette as described, for example, in U.S. Pat. No. 3,985,436 to Tanaka et al. The use of such a cassette enables the easy replacement of those parts of the xerographic machine which are most likely to deteriorate with use, especially the photoreceptor, but also the development and cleaning systems as well as the charge corotron wire. A further advantage of containing the major xerographic process elements within a cassette is that interchangeable cassettes may be used in a given copying machine to provide different development characteristics or different colored development.

In the art of electrostatographic copying it is known that the electrical conductivity of a paper copy sheet influences the quality of image transfer thereto from the imaging member. If the conductivity of the paper is too high, charges on the paper are able to leak away immediately via those parts of the reproducing machine which are in contact with the sheet, such as the paper guides. Many papers suitable for xerographic copy paper have a conductivity which is satisfactory when the paper is dry, but which becomes too high for effective image transfer when the paper is damp. Under conditions of high ambient relative humidity, copy paper which would otherwise be satisfactory, can absorb moisture to an extent where it becomes so conductive that image transfer is badly impaired.

PRIOR ART

To overcome this problem GB No. 2 165 491A to Milton proposes the use of electrically biasing the paper guide to minimize charge leakage from the paper. Thus, the paper guide which guides the paper to the imaging member adjacent the transfer corotron is electrically conductive and is maintained at a predetermined potential approximating the surface potential of a copy sheet during image transfer. To this end the guide is in electrical communication with the shield of the transfer corotron. The shield itself is electrically connected so as to be self-biasing to a potential such as to maintain the predetermined potential on the guide member.

Another problem with moist paper is that there is a tendency for the trail edge to flop away from the imaging member resulting in impaired image transfer and in some cases the image may not be transferred at all at the trail edge.

In U.S. Pat. No. 4,609,276 to Mitzutani there is disclosed a copying machine employing a process cassette, wherein a guide member is present in the main assembly of the machine for guiding copy sheets into contact with the imaging member in the vicinity of the transfer corotron when the cassette is inserted in its operative position in the main assembly. The guide is necessarily disposed in close proximity, e.g. 1 to 2 mm, from the imaging member in order to prevent the developed toner image on the imaging member from being unduly disturbed, e.g. by scattering, when it is transferred to a copy sheet. Because of its very close proximity to the imaging member at least part of the guide member is hingedly mounted on the main assembly of the machine so that it can be pivoted out of the way whenever the process unit is inserted into or removed from the main assembly to avoid causing physical damage to the highly sensitive imaging member. In addition FIGS. 10A through 10G illustrate several alternative arrangements for a process unit to contain various process means. FIG. 10G illustrates a unit which in addition to including an imaging drum, charging device and developer also includes a transfer discharger and a protective cover. In this regard attention is also directed to the discussion in U.S. Pat. No. 4,462,677 to Onoda of FIGS. 13A to 13F at column 8, lines 35 to 64 and U.S. Pat. No. 4,470,689 to Nomura et al of FIGS. 15A to 15F at column 8 lines 15 to 45 concerning the inclusion of a transfer discharger in the process unit. Incorporating the transfer charging device in the cassette housing has the advantage that the charging device itself shields and protects the imaging member from light exposure, damage, and contamination even when the unit is removed from the main assembly of the copying machine, thus dispensing with the need for a separate protecting cover. An additional advantage of having the transfer charging device integral with the unit housing is that it will be replaced automatically whenever the process units is exchanged for a fresh one without having to change the transfer charging device separately.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided an electrostatographic reproducing apparatus comprising a transfer corotron for transferring a developed electrostatic latent image from an imaging member on to a copy sheet, and an electrically conductive guide member for guiding copy sheets in the vicinity of the transfer corotron characterized in that the guide member is integral with the shield of the transfer corotron.

A reproducing machine in accordance with the invention has the advantage that the transfer guide member may be provided simply as an extension of the transfer corotron shield. An additional advantage resulting from the conductivity of the guide member is that an electrical potential applied to the transfer corotron shield will automatically be applied to the paper guide without the need for a separate electrical connection. Hence effective image transfer is possible for more highly conductive paper, e.g. paper with a relatively high moisture content, because current leakage through the paper is reduced. The guide member may be either (a) the entrance guide for guiding copy sheets into contact with the imaging member, or (b) the exit guide for guiding copy sheets away from the imaging member. In a preferred embodiment both the entrance guide and the exit guide are integral with the corotron shield.

According to a further aspect of the present invention there is provided a process unit adapted to be removably mounted in a main assembly of an electrostatographic copying machine, the unit comprising a housing, an imaging member inside the housing, and a transfer corotron for transferring a developed electrostatic latent image from the imaging member to a copy sheet characterized in that the process unit further comprises an electrically conductive guide member integral with the transfer corotron for guiding copy sheets in the vicinity of the imaging member when the process unit is inserted in the main assembly.

In addition to the advantage of enabling effective image transfer with more highly conductive paper as mentioned above, a process unit in accordance with the invention has the distinction over the prior art that the transfer corotron and integral guide member are actually incorporated in the process unit itself and as such may be mounted in close proximity and in fixed relation to the operative position of the imaging member thereby avoiding the risk of physically damaging the imaging member when the process unit is inserted into or removed from the main assembly of the copying machine.

Again, the guide member may be either (a) the entrance guide for guiding copy sheets into contact with the imaging member, or (b) the exit guide for guiding copy sheets away from the imaging member. In a preferred embodiment both the entrance guide and the exit guide are integral with the corotron shield. The integral guide member(s) are automatically biased to the same potential as the corotron shield.

Preferably, the biased exit guide is inclined and contoured in such manner that the trail edge of the copy sheet is tipped to wipe against the imaging member for improved image transfer at the trail edge particularly for moist copy sheets.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. **1** is a schematic cross section of a process unit having a transfer corotron with integral copy sheet guide members in accordance with the invention;

FIG. **2** is a schematic cross section of the process unit taken on the line II—II in FIG. **1**;

FIG. **3** is a cross section showing detail of a latch mechanism for retaining the corotron in the process unit taken on the line III—III in FIG. **2**;

FIG. **4** is a sectional view of the process unit of FIG. **2** partially inserted in the main assembly of a xerographic copier;

FIG. **5** is a perspective view of a ramp flexure member which supports the transfer corotron in the main assembly;

FIG. **6** is a perspective view of the latch in the closed position when the process unit is partially inserted into the main assembly;

FIG. **7** is a cross section showing detail of the latch mechanism of FIG. **2**, but with the latch in the open position;

FIG. **8** is a sectional view of the process unit of FIG. **2** fully inserted in the main assembly;

FIG. **9** is a perspective view of the transfer corotron and integral copy sheet guide members;

FIG. **10** is a sectional view of the process unit of FIG. **8** when it is fully inserted in the main assembly with the transfer corotron in its hinged-open position; and

FIG. **11** is a schematic view in cross section of a reproducing machine having a process cassette according to the present invention.

It is noted that, for the sake of clarity, the Figures are not drawn to scale. In particular in the sectional views the dimensions in the vertical direction have been exaggerated. The same features are denoted by the same reference numerals in each of the Figures.

DETAILED DESCRIPTION OF THE INVENTION

The process unit or cassette **1** shown in FIG. **1** is designed to be removably mounted in the main assembly **100** of a xerographic copier as described, for example, in the aforementioned US patents and also in our copending U.S. patent application No. 38,093 filed Apr. 14, 1987, entitled Process Unit For An Imaging Apparatus in the name of Robert A. Carter commonly assigned to the assignee of the present invention to which reference is invited for further details, The cassette **1** comprises a housing **2** made for example, primarily of polystyrene, which encloses an imaging member in the form of a belt photoreceptor **3** in addition to various process means, in particular a development device **4**, a cleaner **5**, and a charge corotron **6**. The belt photoreceptor is an endless flexible belt having a photosensitive surface. In the arrangement shown, when the cassette **1** is removed from the main assembly of the copier, the belt is only loosely retained in the cassette but when the cassette is inserted into the main assembly of the copying machine, the photoreceptor belt is supported in an operative position by a member **40** forming part of the main assembly (see especially FIG. **8**). A cassette having this kind of loosely retained photoreceptor arrangement forms the subject of our aforementioned copending U.S. patent applicatin No. 38,093.

Returning to FIG. **1**, a transfer charging device **7** is included in the cassette housing in the vicinity of the photoreceptor belt at the area where a toner image is to be transferred from the belt to a copy sheet. The technique of actually transferring a toner image is well known to those skilled in the art and no further details need be given here. The transfer charging device is in the form of a corotron having an outer shield **8** which, as is conventional, is substantially U-shaped and made, for example, of stainless steel. A corona wire **9** extends the full length of the shield **8** and is spaced apart from the walls thereof in the usual manner.

At its upper end the shield has extended portions **10** and **11** on its left-and right-hand sides respectively, as viewed in the drawing. These portions **10** and **11** act as guide members and define the path which a copy sheet follows as it passes through the cassette for the purposes of having a toner image transferred thereto, as described in more detail below. As shown in FIG. **2**, the corotron **7** has end caps **21**, **22** fastened to opposite ends of shield **8**. The end caps **21**, **22** are made of a plastics material. End cap **21** has a laterally-projecting pin extending from its side faces both into and out of the plane of FIG. **2**. The pin **23** is accommodated in sockets **24** formed integrally in the cassette housing, two such sockets being provided, one on each side of the end cap **21**. The pin and socket arrangement is such as to allow the corotron a small amount of vertical movement, typically 2 mm, at its pivoted end. At the opposite end of the corotron **7**, the other end cap **22** has a longitudinally projecting tab **25** which engages in a latch mechanism **26** shown more clearly in FIG. **3**. The tab **25** is held by two jaws **27***a*, **27***b* of the latch which are biased together by an inverted keyhole-shaped spring **28**. The spring **28** is held in place by pairs of tabs **29***a*, **29***b*; **30***a*, **30***b* formed integrally on the inward face of the jaws **27***a*, **27***b*. The upper portion of each jaw **27***a*, **27***b* is provided with a protruding post **31***a*, **31***b* with an enlarged head **33***a*, **33***b* extending from the outward face. The posts **31***a*, **31***b* are accommodated in slots **32***a*, **32***b* respectively in the cassette housing **2**, thus providing a pivotal mounting for the jaws. The enlarged heads **33***a*, **33***b* which act to retain the latch in its own plane are present on the outside of the cassette housing as can be seen more clearly in FIGS. **2** and **6**. The latch is also held in place by two bail bars **34***a*, **34***b* formed on a recessed portion of the internal wall of the cassette housing **2**. The bail bars **34***a*, **34***b* are both joined to the cassette housing at each of their two ends, thereby providing a slot between the bars and the cassette housing through which the jaws **27***a*, **27***b* are threaded, thereby limiting their pivotal movement as well as holding them in their own plane (see FIG. **6**). When the cassette is outside the main assembly of the copying machine, the jaws **27***a*, **27***b* of the latch **26** are closed to grip tab **25** and so support the corotron as shown in FIG. **3**. However, the latch is adapted to be opened automatically to release the corotron when the cassette is inserted into the main assembly of a copying machine, which enables the corotron to be located accurately relative to the photoreceptor and also enables the corotron to be hinged open about pivot pin **23** to allow for clearance of jammed copy sheets, as described in more detail below.

As can be seen from FIGS. **1** and **2**, the outside of the corotron shield **8** forms part of the external wall of the cassette housing **2**.

FIG. **4** shows the situation as the cassette **1** is almost, but not quite, fully inserted into its operative position in the main assembly **100** of a reproducing machine. For the sake of clarity the whole of the machine main assembly is not shown in this Figure. As the cassette is first inserted into the main assembly, the support member **40**, which is integral with the main assembly, enters the cassette **1** through aperture **2***a* in the housing **2** and threads through the belt photoreceptor **3**. To facilitate this threading operation the support **40** is provided with a chamfered leading end face **40***a*. Extending from the end face **40***a* is a spigot **41**, the purpose of which is to actuate the latch mechanism **26** when the cassette is fully inserted in the main assembly as explained in more detail below.

With the cassette in the position shown in FIG. **4**, electrical connection is about to be made with the corotron **7** by means of compression spring **45** which is fastened to block **44** of the main machine assembly. The spring **45** is electrically connected to a high voltage source. As the cassette approaches the position shown in FIG. **4**, the spring **45** enters the tapered bore of socket member **19** projecting from the leading face of the corotron end cap **21**. In FIG. **4**, the socket member is cutaway for enhanced clarity of the features being discussed here. As the cassette continues to be inserted the spring **45** engages around electrical contact **47** protruding within the socket **19**. Contact **47** is tapered in such a manner as to permit the spring **45** to thread over it easily and to ensure intimate electrical contact therewith. The contact **47** is electrically connected to corona wire **9**.

With the cassette at the position shown in FIG. **4**, the underside of leading end cap **21** has just engaged leaf spring **46** which extends cantilever-fashion from the block **44** of the main assembly **100**. Spring **46** acts to urge the corotron **7** up towards the support **40** until a projection **48** provided on the upper surface of end cap **21** abuts the underside of support member **40**. Projection **48** thus acts as a spacer.

Electrical connection is made to the shield **8** of corotron **7** via leaf spring **46**. Being integral therewith the guide members **10** and **11** will be at the same potential as the shield **8**. Suitably, the shield is maintained as a potential of approximately 1 KV preferably in a self-biasing manner, e.g. by grounding the shield via a zener diode circuit as disclosed in GB No. 2 165 491A.

At the same time the end cap **22** at the trailing end of the corotron approaches ramp flexure **49** fastened on a surface **50** which may be withdrawn from the main assembly of the reproducing machine as discussed in more detail below.

The ramp flexure **49** which is shown in more detail in FIG. **5** is made of plastics material, for example polypropylene and comprises a double ramp **51**, **52** in back-to-back configuration defining an apex **53** therebetween. The inwardly extending ramp **51** comprises a lower sloping portion **51***a* and an integral upper portion **51***b* which is more steeply inclined. The ramp **51** is slightly wider than the corotron end cap **22** and is provided with upstanding wall portions **54** at its edges, thus presenting a guide channel for the corotron. Extending from the underside of lower ramp portion **51***a* is a T-shaped lug **55** which extends through a slot **56** in the surface **50** to lock the ramp member **59** thereto. The ramp member is further fastened to the surface **50** by a bifurcated barbed member **57** extending through a slot **58** in the surface **50**. The outwardly extending ramp portion **52** is shorter than the inwardly extending portion **51** and at its lower end curves inwardly and terminates in a block **58** which is bolted to an upstanding flange **50***a* at the outside edge of surface **50**. The ramp portion **52** provides a guide surface for the leading end cap **21** of corotron **7** when the cassette is first inserted into the main assembly **100**.

As the cassette is inserted further, the spigot **41** of the support member **40** approaches the latch mechanism **26**. Referring to FIG. **6**, it can be seen that the spigot **41** is aligned with two substantially semicircular boss members **60**, **61** at the facing edges of the two jaws **27***a*, **27***b*. The boss members **60**, **61** are each chamfered at their

inwardly directed faces 60*a*, 61*a* respectively. As the cassette approaches its fully inserted position within the main assembly **100** the spigot **41** engages the bosses **60**, **61** at their chamfered surfaces 60*a*, 61*a* and prizes them apart against the bias of spring **28**, thus forcing the jaws 27*a*, 27*b* to move apart thereby releasing tab **25** of corotron end cap **22** as shown in FIG. 7. At this stage the trailing end of the corotron will drop slightly under its own weight until it abuts ramp portion **52** of ramp flexure **49**.

The cassette is then pushed all the way to its fully inserted position in which the underside of end cap **22** is supported by the apex **53** of ramp flexure **49**, as shown in FIG. **8**. The ramp flexure **49** acts to urge the trailing end of the corotron up towards the support **40** until two flange-like projections **62** provided on the top side of end cap **22** abut the underside of support member **40** and thus act as spacers. Thus the projection **48** on end cap **21** and the two projections **62** on end cap **22** which can be seen most clearly in FIG. **9** act as spacers which accurately locate the corotron **7** relative to the support member **40**.

As described in our aforementioned copending U.S. application No. 038,093 the photoreceptor belt **3** may be tensioned after the cassette has been fully inserted in the main assembly, e.g. by using a pair of rollers (not shown here) which can be moved apart, whereupon the belt **3** will adopt an operative position in which it conforms closely with the support member **40**. It follows, therefore, that by accurately locating the corotron **7** relative to the support member **40** it is also located accurately relative to the photoreceptor, as required.

Although the ramp flexure **49** may itself be sufficiently resilient to urge the corotron **7** against the support member **40** additional bias may be provided by threading a compression spring (not shown) over bifurcated member **57** so that it buts against the apex **53** of the flexure **49** at its upper end and against the surface **50** at its lower end.

As shown in FIG. **1**, an aperture **14** is present between the right-hand extension **11** of corotron shield **8** and the main part of the cassette housing to enable a copy sheet to enter the process unit for the purpose of transferring an image thereto from the photoreceptor belt **3** in the vicinity of the transfer corotron when the cassette is inserted into the main assembly of the copying machine. The aperture **14** is in the form of a slot extending substantially the full width of the cassette and is relatively narrow, for example, 2 mm wide. Thus the slot is sufficiently wide to permit a copy sheet to enter the cassette, but narrow enough to provide appreciable protection for the photoreceptor from damage, contamination, and light exposure, thus prolonging the useful life of the photoreceptor.

The path which a copy sheet follows as it passes through the cassette for image transfer purposes is denoted by an arrow in FIG. **1**. The external wall portion **15** of the main part of the cassette housing is shaped so as to deflect and guide the approaching copy sheets towards the aperture **14**. Furthermore, the extreme right-hand side of the extended portion **11** of corotron shield **8** has a downturned lip **16** inclined obtusely relative to the adjacent plateau portion **17**. The downturned lip **16** thus also acts to guide approaching copy sheets towards the aperture **14**.

As the copy sheet enters the cassette it follows the path defined between the photoreceptor belt **3** and the plateau portion **17** of the corotron shield extension **11** which thus acts as a paper guide. By virtue of the electric connection to the shield **8** described previously, shield extension **11** being integral therewith is held at the same potential as the shield, as mentioned previously, typically 1 KV. By biasing the paper guide **11** in this way current leakage through the copy sheet is reduced during image transfer enabling the use of more highly conductive paper, e.g. paper with a relatively high moisture content, while still achieving high quality image transfer. The copy sheet then passes over the main part (i.e. the shield **8** and the wire **9**) of the transfer corotron **7** where it comes into contact with the photoreceptor belt **3** when the toner image is transferred from the photoreceptor belt to the copy sheet itself in known manner. From there the copy sheet traverses the slightly upwardly inclined ramp **18** forming part of the shield extension **10** on the left-hand side of the corotron **7**, and thence to aperture **20** in the cassette housing where the copy sheet exists the cassette for further processing, in particular for the toner image to be fixed permanently to the copy sheet using techniques well known to persons skilled in the art. The shield extension **10** acts as an exit paper guide and being integral with the corotron shield **8** is also held at the same potential. Hence current leakage through the copy sheet is also reduced as the copy sheet exits the cassette enabling effective image transfer even to the trailing edge of the copy sheet by which time the leading edge may have come into contact with other parts of the main assembly through which the copy sheet might otherwise discharge.

The ramp **18** also has a slightly convex configuration (as seen by the copy sheet) which tends to cause the trail edge of the copy sheet to tip up after it leaves the entrance guide **11** and wipe against the imaging member **3** thereby ensuring positive contact and consequently effective image transfer even at the trail edge of moist copy sheets.

In case a copy sheet becomes jammed while it passes through the cassette **2**, surface **50** with the ramp flexure **49** mounted thereon may be withdrawn manually from the main assembly **100** of the reproducing machine when the cassette is fully inserted therein, as shown in FIG. **10**. As the surface **50** and ramp **49** are withdrawn the end cap **22** of corotron **7** will begin to descend the ramp **51** of ramp flexure **49**, because it is no longer retained by latch **26**. The end cap **22** is guided down the ramp **51** by edge wall portions **54**. As the free end of the corotron descends, it pivots about hinge pin **23** at the other end cap **21**. Leaf spring **46** is displaced against subjacent platform **68** extending from the block **44** in the main assembly **100**. As the surface **50** continues to be withdrawn, the corotron end cap **22** continues to descend ramp portion **51** unti it engages the surface **50** which limits the corotron's pivotal movement. FIG. **10** shows the corotron **7** hinged in its fully open position away from the photoreceptor to permit access to the transfer region of the cassette, especially for clearing copy sheets which may have jammed there without damaging the photoreceptor. Once the jam has been cleared, the corotron **7** is returned to its former operative position simply by reinserting surface **50**. Initially the end cap **22** will slide along the surface **50** until the ramp flexure **49** approaches when it will begin to ascend ramp portion **51** again guided by edge wall portions **54**. For this purpose, end cap **22** is flanked by a pair of wings **66** with outwardly extending sloping faces **67** complementary to ramp **51** to facilitate sliding there-

over. When the surface **50** is returned to its fully inserted position, the corotron end cap **22** reverts to its former position at the apex **53** of ramp flexure **49** with the projecting flanges **62** abutting the supporting member **40** of the main assembly **100**, as shown in FIG. **8**. When it comes to removing the cassette **1** from the main assembly **2** the spigot **41** of support **40** disengages from the latch **26** whereby the jaws **27***a*, **27***b* of the latch close together under the bias of spring **28** to regrip the tab **25** of corotron end cap **22**. Thus, when the cassette is removed from the main assembly the transfer corotron is automatically latched back into, and as such again becomes an integral part of, the cassette housing **2**.

Referring now to FIG. **11**, there is shown schematically a xerographic printing machine **110** having the removable process unit **1** of the present invention in its operational position in the main assembly **100**. The machine includes an endless flexible photoreceptor belt **3** mounted for rotation in the clockwise direction as shown about support rollers **111***a* and **111***b* to carry the photosensitive imaging surface **112** of the belt **3** sequentially through a series of xerographic processing stations, namely a charging station **114**, an imaging station **116**, a development station **118**, a transfer station **110**, and a cleaning station **122**.

The charging station **114** comprises a corotron **6** which deposits a uniform electrostatic charge on the photoreceptor belt **3**. The photoreceptor belt **3**, the charge corotron **6**, the developer device **4**, the transfer corotron **7**, and the blade cleaner **5** may all be incorporated in a process cassette **1** adapted to be removably mounted in the main assembly **100** of the xerographic copier as described in aforementioned copending application Ser. No. 038,093.

An original document D to be reproduced is positioned on a platen **124** and is illuminated in known manner a narrow strip at a time by a light source comprising a tungsten halogen lamp **126**. Light from the lamp is concentrated by an elliptical reflector **125** to cast a narrow strip of light on to the side of the original document D facing the platen **124**. Document D thus exposed is imaged on to the photoreceptor **1** via a system of mirrors M1 to M6 and a focusing lens **127**. The optical image selectively discharges the photoreceptor in image configuration, whereby an electrostatic latent image of the original document is laid down on the belt surface at imaging station **116**. In order to copy the whole original document the lamp **126**, the reflector **125**, and mirror M1 are mounted on a full rate carriage (not shown) which travels laterally at a given speed directly below the platen and thereby scans the whole document. Because of the folded optical path the mirrors M2 and M3 are mounted on another carriage (not shown) which travels laterally at half the speed of the full rate carriage in order to maintain the optical path constant. The photoreceptor **1** is also in motion whereby the image is laid down strip by strip to reproduce the whole of the original document as an image on the photoreceptor.

By varying the speed of the scan carriages relative to the photoreceptor belt **1** it is possible to alter the size of the image along the length of the belt, i.e. in the scanning direction. In full size copying, that is to say with unity magnification, the speed of the full rate carriage and the speed of the photoreceptor belt are equal. Increasing the speed of the scan carriage makes the image shorter, i.e. reduction, and decreasing the speed of the scan carriage makes the image longer, i.e. magnification.

The image size can also be varied in the direction orthogonal to the scan direction by moving the lens **127** along its optical axis closer to the original document i.e. closer to mirrors M2 and M3, for magnification greater than unity, and away from the mirrors M2 and M3 for reduction, i.e. magnification less than unity. When the lens **127** is moved, the length of the optical path between the lens and the photoreceptor, i.e. the image distance, is also varied by moving mirrors M4 and M5 in unison to ensure that the image is properly focused on the photoreceptor **1**. For this purpose mirrors M4 and M5 are suitably mounted on a further carriage (not shown).

At the development station **118**, a magnetic brush developer device with a developer roll **128** develops the electrostatic latent image into visible form. Here, toner is dispensed from hopper (not shown) into developer housing **129** which contains a two-component developer mixture comprising a magnetically attractable carrier and the toner, which is deposited on the charged area of belt **1** by a developer roll **128**.

The developed image is transferred at transfer station **120** from the belt to a sheet of copy paper according to the practice of the present invention. The copy paper is delivered into contact with the belt in synchronous relation to the image from a paper supply system **131** in which a stack of paper copy sheets **132** is stored on a tray **133**. The top sheet of the stack in the tray is brought, as required, into feeding engagement with a top sheet separator/feeder **134**. Sheet feeder **134** feeds the top copy sheet of the stack towards the photoreceptor around a 180° path via two sets of nip roll pairs **135** and **136**. The path followed by the copy sheets through the aperture in the cassette is denoted by a broken line. At the transfer station **120** transfer corotron **7** provides the electric field to assist in the transfer of the toner particles thereto.

The copy sheet bearing the developed image is then stripped from the belt **1** and subsequently conveyed to a fusing station **138** which comprises a heated roll fuser **139** to which release oil may be applied in known manner. The image is fixed to the copy sheet by the heat and pressure in the nip between the two rolls **139** and **140** of the fuser. The final copy is fed by the fuser rolls into catch tray **141** via two further nip roll pairs **142** and **143**.

After transfer of the developed image from the belt some toner particles usually remain on the surface of the belt, and these are removed at the cleaning station **122** by a cleaner blade **5** which scrapes residual toner from the belt. The toner particles thus removed fall into a receptacle **145** below. Also, any electrostatic charges remaining on the belt are discharged by exposure to an erase lamp **146** which provides an even distribution of light across the photoreceptor surface. The photoreceptor is then ready to be charged again by the charging corotron **6** as the first step in the next copy cycle.

The patents and applications referred to herein are hereby specifically and totally incorporated herein by reference.

From the foregoing it will be evident that various modifications may be made within the scope of the present invention. For example, instead of a flexible belt the imaging member may comprise a photoreceptor drum as commonly used in xerographic machines. Moreover, apart from the transfer corotron, the cassette may enclose additional or alternative processing means

to those described above. Alternatively, it is not necessary for the copying machine to employ a cassette or process unit as described above. Instead, the xerographic components, including the transfer corotron may all be fixed within the main assembly of the copier in conventional manner, the transfer guide member nevertheless being formed integrally with the shield of the transfer corotron. In addition, while the invention has been illustrated with repect to copying apparatus it will be understood that it may be used in printer apparatus wherein a light beam such as a laser beam may be used to selectively dicharge portions of the photoconductor. All such modifications and embodiments as may readily occur to the artisan are intended to be within the scope of the appended claim.

I claim:

1. Electrostatographic reproducing apparatus comprising a transfer corotron for transferring a developed electrostatic latent image from an imaging member onto a copy sheet, and an electrically conductive guide member for guiding copy sheets in the vicinity of the transfer corotron said guide member being integral with the shield of the transfer corotron and comprising an upwardly inclined ramp having a convex configuration as seen by the copy sheet.

2. A process unit adapted to be removably mounted in a main assembly of an electrostatographic copying machine, the unit comprising a housing, an imaging member inside the housing, and a transfer corotron for transferring a developed image from the imaging member to a copy sheet, said process unit further comprising an electrically conductive guide member integral with the transfer corotron for guiding copy sheets in the vicinity of the imaging member when the process unit is inserted in the main assembly.

3. A process unit as claimed in claim 2 wherein the guide member is an entrance guide for guiding copy sheets into contact with the imaging member for image transfer thereto.

4. A process unit as claimed in claim 2, wherein the guide member is an exit guide for guiding copy sheets away from the imaging member after image transfer thereto.

5. A process unit as claimed in claim 4, wherein the exit guide is adapted to tip the trail edge of the copy sheet into positive contact with the image member for image transfer.

6. A process unit as claimed in claim 5, wherein the exit guide comprises an upwardly inclined ramp having a convex configuration as seen by the copy sheet.

7. A process unit as claimed in claim 2 wherein a wall portion of the housing provides guide means to assist in guiding the copy sheet into contact with the imaging member in the vicinity of the transfer corotron.

8. An electrostatographic copying machine, comprising a main assembly, and a process unit comprising a housing, an imaging member inside the housing, and a transfer corotron for transferring a developed image from the imaging member to a copy sheet, said process unit further comprising an electrically conductive guide member integral with the transfer corotron for guiding copy sheets in the vicinity of the imaging member when the process unit is inserted in the main assembly.

9. An electrostatographic copying machine of claim 8 wherein the guide member is an entrance guide for guiding copy sheets into contact with the imaging member for image transfer thereto.

10. An electrostatographic copying machine of claim 8, wherein the guide member is an exit guide for guiding copy sheet away from the imaging member after image transfer thereto.

11. An electrostatographic copying machine of claim 10, wherein the exit guide is adapted to tip the trail edge of the copy sheet into positive contact with the image member for image transfer.

12. An electrostatographic copying machine of claim 11 wherein the exit guide comprises an upwardly inclined ramp having a convex configuration as seen by the copy sheet.

13. An electrostatographic copying machine of claim 8 wherein a wall portion of the housing provides guide means to assist in guiding the copy sheet into contact with the imaging member in the vicinity of the transfer corotron.

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